

Holding Tank Sewage Systems

Recommended Standards and Guidance for
Performance, Application, Design and Operation & Maintenance



Washington State Department of Health
Office of Community Environmental Health Programs
New Market Industrial Center
7171 Cleanwater Lane, Building 2
PO Box 47826
Olympia, Washington 98504-7826

Tel: 360.236.3063
FAX: 360.236.2251
Webpage: <http://www.doh.wa.gov>

Preface

The recommended standards contained in this document have been developed for statewide application. Regional differences may, however, result in application of this technology in a manner different than it is presented here. In some localities, greater allowances than those described here may reasonably be granted. In other localities, allowances that are provided for in this document may be restricted. In either setting, the local health officer has full authority in the application of this technology, consistent with Chapter 246-272 WAC and local jurisdictional rules. If any provision of these recommended standards is inconsistent with local jurisdictional rules, regulations, ordinances, policies, procedures, or practices, the local standards take precedence. Application of the recommended standards presented here is at the full discretion of the local health officer.

Local jurisdictional application of these recommended standards may be:

- 1) **Adopted as part of local rules, regulations or ordinances**—When the recommended standards, either as they are written or modified to more accurately reflect local conditions, are adopted as part of the local rules, their application is governed by local rule authority.
- 2) **Referred to as technical guidance in the application of the technology**—The recommended standards, either as they are written or modified to more accurately reflect local conditions, may be used locally as technical guidance.

Application of these recommended standards may occur in a manner that combines these two approaches. How these recommended standards are applied at the local jurisdictional level remains at the discretion of the local health officer and the local board of health.

The recommended standards presented here are provided in typical rule language to assist those local jurisdictions where adoption in local rules is the preferred option. Other information and guidance is presented in text boxes with a modified font style to easily distinguish it from the recommended standards.

Acknowledgements—

The Department of Health Wastewater Management Program appreciates the contribution of many persons in the on-going development, review, and up-dating of the Recommended Standards and Guidance documents. The quality of this effort is much improved by the dedication, energy, and input from these persons, including:

- ❑ Geoflow, Inc.
- ❑ Lombardi and Associates
- ❑ Orenco Systems, Inc.
- ❑ Puget Sound Water Quality Action Team
- ❑ Sun-Mar Corporation
- ❑ Washington State On-Site Sewage Association (WOSSA)
- ❑ Washington State On-Site Sewage Treatment Technical Review Committee (TRC)
- ❑ Waste Water Technologies

Table of Contents

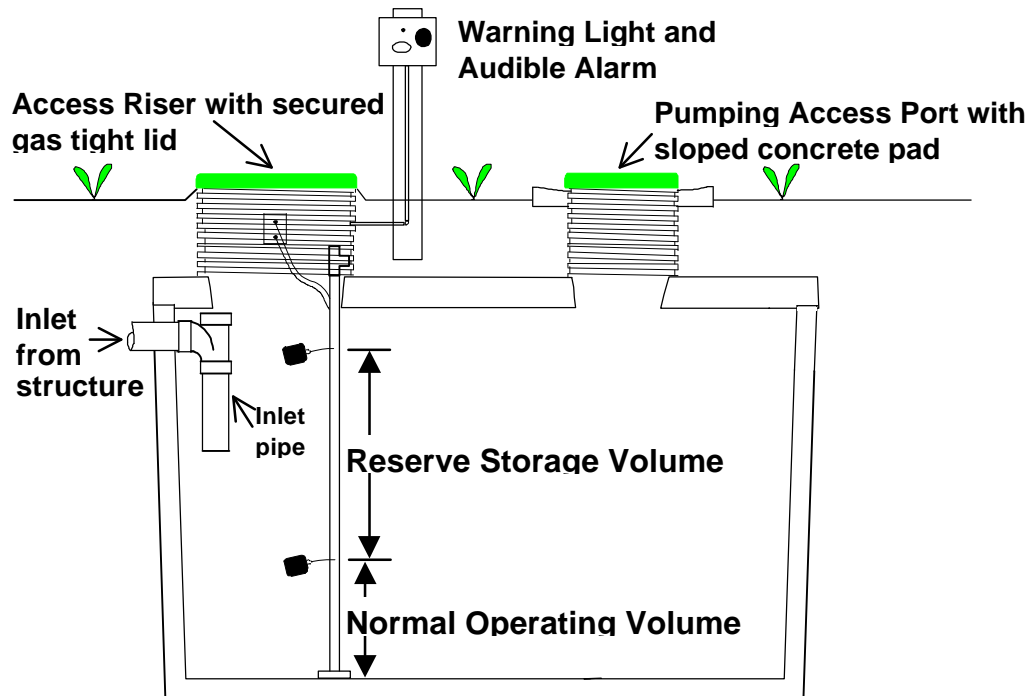
Preface—	Page 2
Acknowledgements—	Page 3
Table of Contents—	Page 4
Introduction—	Page 5
Performance Standards—	Page 6
Application Standards—	Page 6 - 8
Design Standards—	Page 8 – 11
Operation & Maintenance Standards—	Page 11 - 14

Introduction—

A Holding Tank Sewage System (HTSS) is an alternative to a conventional on-site sewage system with very special and limited applications. Simply, the HTSS provides a means to collect and temporarily store sewage from a facility or dwelling, for subsequent removal and transport to an approved treatment and disposal site. Depending upon the facility served or the particular set of circumstances surrounding the use of a HTSS, the expense of sewage pumping, hauling, and disposal at an approved facility can be very costly, especially on a long-term basis. In addition, the potential for operational/ management problems with resulting public exposure to raw sewage is significant. For this reason, use of a HTSS must be closely regulated by the local health agency.

A HTSS is an on-site sewage system that incorporates a holding tank, the services of a sewage pumper / hauler, and the off-site treatment and disposal of the sewage generated at the site served by the HTSS.

Figure 1. Longitudinal-section of typical Holding Tank Sewage System.



- 1. Performance**—Holding Tank Sewage Systems must provide safe and adequate temporary storage of sewage, with scheduled and approved pumping service followed by approved off-site treatment and disposal of the stored sewage. By design, installation, and operation and maintenance HTSS must not contaminate ground or surface waters, expose the public to untreated sewage or be a source of nuisance odors.
- 2. Application**—
 - 2.1. Permitting**—Before installing and using a HTSS, a permit that addresses installation, operation and maintenance must be obtained from the local health agency. The permit should include specific information and requirements for pumping service frequency and approved disposal of holding tank contents. The local health officer may permit Holding Tank Sewage Systems only in the following cases:
 - 2.1.1. Emergency Use**—Emergency situations, regardless of source of the sewage, either commercial or residential. Emergency situations are limited to those where an approved repair or replacement sewage system installation is delayed due to weather conditions, and/or weather-induced soil or site conditions.
 - 2.1.2. Permanent Use**—
 - ◆ Controlled, part-time, commercial usage situations, such as recreational vehicle parks, trailer dump stations, campgrounds, marinas, etc.
 - ◆ Repair of failing on-site sewage systems - but only where no other option is feasible. The local health officer must first determine that the following options are not feasible:
 - ⇒ Conventional on-site sewage system;
 - ⇒ Conventional on-site sewage system with off-site drainfield;
 - ⇒ Alternative on-site sewage system with enhanced treatment prior to disposal to the receiving soils;
 - ⇒ Connection to a publicly, or privately, owned larger on-site sewage system.;
 - ⇒ Connection to public sewer; or,
 - ⇒ Connection of an effluent pump to a public sewer.
 - 2.2. Siting**—
 - 2.2.1.**The holding tank portion of the holding tank sewage system must be located in such a way as to facilitate pumping while limiting the general public exposure to, or nuisance caused by, accidental sewage spillage during pumping..
 - 2.2.2.**The holding tank sewage system must meet the same horizontal set-backs required for septic tanks by WAC 246-272-140, (Location)

Table 1 - Minimum Horizontal Separations

Items requiring setback	From septic tank, holding tank, or pump chamber.
Non-public well or suction line	50 ft.
Public drinking water well	100 ft.
Spring or surface water used as drinking water source ^{1,5}	50 ft.
Public drinking water spring	200 ft.
Pressurized water supply line ²	10 ft.
Properly decommissioned well ³	N/A
Surface water ⁵	
Marine water	50 ft.
Fresh water	50 ft.
Building foundation ^{6,7}	5 ft.
Property or easement line ^{6,7}	5 ft.
Interceptor/curtain drains/drainage ditches:	
Down-gradient ⁷	5 ft.
Up-gradient ⁷	N/A

- ¹ If the spring or surface water is used as a public drinking water supply, the designer shall locate the on-site sewage system outside of the required sanitary control area.
- ² The local health officer may approve a sewer transport line within 10 feet of a water supply line if the sewer line is constructed in accordance with Section C1.101 of the Department of Ecology "Criteria For Sewage Works Design," Revised 1989, or equivalent.
- ³ For distances under 100 ft., the designer shall submit a "decommissioned water well report" provided by a licensed well driller, which verifies that appropriate decommissioning procedures noted in chapter 173-160 WAC were followed. Once the well is properly decommissioned, it no longer provides a potential conduit to groundwater, but a holding tank should not be built directly over the site.
- ⁵ Measured from the ordinary high-water mark.
- ⁶ The local health officer may allow a reduced horizontal separation where the property line, easement line or interceptor is up-gradient.
- ⁷ The item is down-gradient when liquid will flow toward it upon encountering a water table or a restrictive layer. The item is up-gradient when liquid will flow away from it upon encountering a water table or restrictive layer.

2.3. Installation— Holding tank systems must be installed according to the design approved by the local health officer in accordance with the local health department permit requirements.

2.4. Inspection—The holding tank system installation must be inspected by the local health officer before use. The local health officer may inspect various items, including, but not limited to, the following:

- 2.4.1.** Water-tightness of the tank, tested at site after installation, by filling with water;
- 2.4.2.** Non-buoyancy in high groundwater areas or conditions;
- 2.4.3.** Leak-proof nature of the service access(es), access ports, risers, lids, and covers;
- 2.4.4.** Methods to secure the lids and covers from inappropriate or unapproved access;

- 2.4.5. Methods of venting provided by the design and the installation. Venting should exhaust above the roof line of the building;
- 2.4.6. Impervious surfaces around the access ports, equipment and methods for cleaning sewage spills; and
- 2.4.7. Alarm functions.

3. Design—

3.1. Tank Design / Material Requirements—

3.1.1. Holding tanks must be approved by the local health officer and the Department of Health.

3.1.2. Holding tanks must be:

- ◆ designed, constructed, and installed to maintain water-tightness; and
- ◆ designed, constructed, and installed to withstand anticipated stresses associated of use which includes resistance to effects of raw sewage, and ability to withstand internal and external loading.

3.1.3. If buried, the tank:

- ◆ must be inherently non-buoyant so as to prevent floating when empty during high groundwater periods if such events are anticipated. A tank is non-buoyant if installed above the groundwater elevation, weight of the empty tank exceeds buoyant forces, or “side wings” anchor the tank into surrounding soil;
- ◆ must be able to withstand traffic loading if the area is subject to vehicular traffic loads; and,
- ◆ may be pre-cast or cast-in-place concrete; fiberglass or polyethylene.

3.1.4. If installed above-ground, the tank:

- ◆ must be designed and constructed to function as needed, retain shape, integrity, and water-tightness;
- ◆ must provide adequate support for all associated piping; and
- ◆ may be concrete, fiberglass or polyethylene.

3.2. **Sizing**— Establishing the holding tank capacity requires consideration of both design and operational aspects. The required storage capacity depends upon two items: daily sewage flow, and available or optimal pumping service frequency.

3.3. Design Considerations—

3.3.1. **Daily Sewage Flow**—Minimizing the daily sewage flow is prudent. If the facility is to be permanently served by the holding tank sewage system, incorporating water-saving fixtures and processes where possible within the facility is required. Use the same daily design flow estimates as for a conventional on-site sewage system {see WAC 246-272-150 (3)}.

3.3.2. **Pumping Service Frequency**—Establishing the required pumping service frequency depends upon various conditions:

- ◆ where facility use, or wastewater generation is low and service response is good, an "on-call" operation may be acceptable

- ◆ where facility use, or wastewater generation, is high, regularly scheduled pumping service is preferred. The scheduled pumping frequency will depend upon the holding tank(s) storage capacity, the hauling volume capacity of the service vehicle, proximity of a suitable disposal site, travel time and service costs.

In general, holding tanks requiring regular service should be pumped once or twice each week. Some commercial facilities may require more frequent service while some low-use domestic facilities may function quite satisfactorily with "on-call" service. For sizing purposes, however, pumping should occur at least weekly because less frequent pumping, as with "on-call" operations, may lead to more odor-related nuisance problems.

3.3.3. Holding Tank Sizing Criteria—Tank sizing consists of two portions, called “normal operating volume”(NOV), and “reserve storage volume” (RSV):

- ◆ The normal operating volume (NOV) is the liquid storage below the "time-to-pump" alarm level. The required normal operating volume is calculated by multiplying the estimated daily sewage flow by the number of days between pumping service visits as shown by the following formula:

$$\text{NOV} = (\text{DSF}) (\text{PSF})$$

Where:

NOV Normal operating volume

DSF = Daily sewage flow

PSF = Pumping service frequency (Number of days between pumping, not to exceed 7 even if service is “on-call”.)

- ◆ The reserve storage volume (RSV) is the liquid storage capacity above the "time-to-pump" alarm level, and below the invert of the inlet pipe. The reserve storage capacity must be at least 3 times greater than the anticipated daily design flow for the facility. There may be special cases where a three-day reserve storage is insufficient, in which case additional reserve storage should be addressed by the design. The calculation for determining reserve storage is shown in the following formula:

$$\text{RS} = (\text{DSF}) (3)$$

Where:

RS = Reserve storage volume

DSF = Daily sewage flow

- ◆ The “total liquid volume capacity” (TLVC) must consist of the normal operating volume (NOV) plus reserve storage volume (RSV). Total liquid volume capacity is calculated as shown by the following formula:

$$TLVC = (NOV) + (RSV)$$

Where:

TLVC = Total liquid volume capacity

NOV = Normal operating capacity

RSV = Reserve storage volume

- ◆ The Total Liquid Volume Capacity can be met with multiple holding tanks.

A Sample Calculation—

A holding tank sewage system is being designed for a small marina with a daily sewage flow of 500 gallons which will be serviced once each week. How much total liquid volume capacity will be needed to serve the needs of this facility?

(Step 1) Normal operating volume (NOV) is 7 times the daily design flow because a week is 7 days, therefore;

$$NOV = (500 \text{ GPD}) (7)$$

$$NOV = 3500 \text{ gallons}$$

(Step 2) Since reserve storage capacity (RS) must be three times greater than the daily design flow, it is multiplied by 3:

$$RSV = (500 \text{ GPD}) (3)$$

$$RSV = 1500 \text{ gallons}$$

(Step 3) The total liquid volume capacity of the holding tank(s) must include both the normal operating volume (NOV) and reserve storage volume (RSV), so these two values are added together.

$$TLVC = NOV + RSV$$

$$TLVC = 3500 \text{ gallons} + 1500 \text{ gallons}$$

$$TLVC = 5000 \text{ gallons}$$

3.4. Alarms—Both audible and visual alarms are required.

3.4.1. The alarms must be set to signal at the "time-to-pump" and "exceeding reserve storage volume" levels.

3.4.2. The audible and visual alarm enunciators must be located outside the facility, with battery power where electrical power is not available.

3.4.3. Only the audible alarm may be turned off by the user.

3.5. Piping—All plumbing connections must be watertight and such that if the holding tank is full, further use of the system will cause sewage to back up into fixtures within the facility served. Use of the holding tank sewage system beyond the rated tank capacity must not allow discharge of sewage to the ground surface through the service access, pumping access ports, or vent openings.

3.5.1. Gravity flow to tank - conventional plumbing requirements apply.

- 3.5.2. Pressure flow to tank - pump activation and deactivation must be double-controlled by float switches within the pump chamber and holding tank, not solely in the pump chamber. This is intended to prevent pumping excess sewage to the holding tank.
- 3.5.3. Multiple tank installations - piping and all connections must be watertight and securely bedded and back-filled to prevent groundwater infiltration and sewage exfiltration.
- 3.5.4. In areas where freezing is a concern, all piping must be adequately protected by design and installation.
- 3.5.5. Aboveground tank installations present particular concerns for physical damage for piping and tanks. Whenever piping is aboveground or exposed to potential physical damage or breakage, it must be adequately supported and protected. Where multiple, interconnected tanks will be installed, they should prevent breakage of connections by differential settling through use of a common slab, flexible connections or bedding.

3.6. Venting and Odor Control—

- 3.6.1. Gravity Flow to the Holding Tank—Separate venting directly from the holding tank is not required since the holding tank will vent through the building sewer line. Special care will be necessary however to assure that pumping and service access port lids are leak-proof so all sewage gases will vent through the facility waste vent pipes.
- 3.6.2. Pressure Flow to the Holding Tank—Direct venting of the holding tank is required since gases will not adequately vent through the pressurized line from a sewage pump. Vent pipes should terminate high enough and away from area of human activity to avoid vent stack odors and related nuisances. To assure that the sewage gases vent through the vent stack, pumping and service access port lids must be leak proof.

3.7. Overflow Provisions—The holding tank system must be designed and installed such that no overflow is allowed, other than within the structure at the elevation of the lowest fixture served.

3.8. Surface Water—Landscaping adjacent to the holding tank system should direct surface water flow away from the tank and access points.

3.9. Materials—Construction materials used throughout the holding tank system must be able to function as designed while exposed to sewage, sewage gases, and physical forces caused by repeated tank filling and pumping which is inherent to system operation.

4. Operation and Maintenance—

4.1. Pumping and Service—A holding tank system requires regular pumping and servicing. To assure that this work can be performed efficiently, the system must be designed, installed, and maintained in a way which promotes ease of access for pumping and cleanup.

4.1.1. Service access must be provided by:

- ◆ at least one for each compartment or separate tank;
- ◆ being brought to or above ground surface; and
- ◆ with a minimum inside diameter or square dimension of 20 inches

4.1.2. Pumping access ports:

- ◆ may be used in lieu of additional service access where additional access points are needed to efficiently pump the tank(s); and used in addition to service access.
- ◆ must have a minimum inside diameter or square dimension of 10 inches.

4.1.3. Large tanks (greater than 2000 gallons) must have multiple access points (Service access or pumping access ports) to allow for efficient pumping of all contents.

4.1.4. Methods of securing covers must be used for all access points located at or above the ground surface to secure service accesses or access ports from inappropriate or unapproved access.

4.1.5. All covers must be leak-proof to preclude infiltration or exfiltration of liquid or the escape of nuisance odors or hazardous gases.

4.1.6. Design and installation of the system must provide a means to "wash down" the area around the pumping access port(s) and service access(s).

- ◆ The surface adjacent to the access port(s) and service access(s) must be impervious to sewage and sloped so any spilled sewage and/or associated wash down water will drain back into the holding tank.
- ◆ If the wash down hose could enter the holding tank, a back-flow prevention device must be installed on the water supply. The back-flow preventer should be accessible for periodic servicing as needed.

4.2. Pumping Service Contracts—Before a permit is issued for installation of a holding tank sewage system, the owner of the system must submit to the local health officer complete documentation in a manner prescribed by, and address these items to the satisfaction of, the local health officer:

4.2.1. Service contract with a certified and licensed sewage system pumping firm;

4.2.2. Frequency of pumping, by schedule or call-for-service;

4.2.3. Financial guarantee for operation, such as a bond or an assignment of funds, in the amount specified by the health officer or operation by a public agency. It is suggested that financial guarantee be in an amount at least equal to the cost of one year's service, and/or the estimated cost of cleanup and abatement of a sewage spill;

4.3. Operational Permit—The local health officer must require an annual operational agreement and may collect fees to over see operation of the holding tank system. The operation agreement must include as a minimum:

4.3.1. Pumping, hauling, and disposal must be by a sewage pumping contractor certified, licensed and approved by a local health officer;

4.3.2. Disposal of sewage from a holding tank system must be at a site or sites approved by the local health officer in the jurisdiction where the sewage is disposed;

4.3.3. Operational records must be maintained by the owner and pumper which include information about pumping frequency, sewage volume, disposal site(s), proof of acceptance by the disposal site operator, alarms, and system servicing and repairs;

4.3.4. Copies of operation records must be submitted to the local health officer according to permit requirements;

- 4.3.5. An emergency response plan which addresses possible failure of a pump to provide service, hydraulic overload holding tank system, sewage spill at the site; and,
 - 4.3.6. Establish the right of the permitter to inspect the facility.
 - 4.4. **Disposal of Contents**—Contents of the holding tank must be pumped, hauled and disposed of in a manner approved by the local health officer.
 - 4.4.1. No sewage from the holding tank system must be applied onto the ground surface, into ground water or surface waters.
 - 4.4.2. Sewage from a holding tank system may be applied into:
 - ◆ the ground only in an approved on-site sewage system, with the knowledge and consent of the local health officer;
 - ◆ a wastewater treatment facility approved by the Department of Ecology; or,
 - ◆ other treatment and disposal sites approved by the local health officer.
-

Large On-Site Sewage Systems

Sewage systems serving facilities with daily design flows between 3,500 and 14,500 gallons per day are permitted under the jurisdiction of the Washington State Department of Health, except in counties where this program is operated by the local health jurisdiction under contract with the department. In all cases the Department of Health requirements must, at a minimum, be met.

Application, engineering, design, construction, inspection, and operation and maintenance requirements for large on-site systems are detailed in the Design Standards For Large On-Site Sewage Systems with Design Flows of Greater Than 3,500 Gallons Per Day, DOH, July 1994.

These guidelines do not provide for the use of holding tank sewage systems for larger systems, but there may be special circumstances where waiver of requirements may be appropriate on a case-by-case basis. In such cases the following criteria or issues, at a minimum, must be addressed to the satisfaction of the reviewing agency. If a waiver is granted by the department which allows use of a holding tank sewage system, it must comply with all standards stipulated by this document.

Requirement for use of a holding tank sewage system for flows between 3,500 and 14,500 gallons per day (LOSS) include:

- The facility served, the proposed interim-use holding tank sewage system, and long-term sewage treatment and disposal system serving the facility must be owned by a public entity, although not necessarily the same public entity.
- Continual operation and management of the holding tank sewage system must be conducted by an appropriate and approved publicly owned entity, such as a public utility district.
- The holding tank sewage system must be for short-term interim use only where a long-term sewage treatment and disposal facility:
 - ◆ currently exists with plans and committed construction funds to extend service to the proposed facility; or

- ◆ is proposed with approved plans and committed construction funds which will provide sewage treatment and disposal service to the proposed facility within a reasonable, approved, time-period.
- The entire sewage treatment and disposal project, including the short-term use holding tank sewage system and proposed long-term system, must meet all appropriate review and approval procedures required for larger on-site sewage systems.
- A complete engineering report must be submitted to the Washington State Department of Health, or, if in a county with jurisdiction-by-contract, the local health agency. The engineering report must as a minimum, in addition to other design aspects document in detail:
 - ◆ the existing sewage treatment plant capacity and commitment by the responsible management entity that the required portion of plant capacity will be reserved and allocated to the facility to be served for the anticipated use period of the holding tank sewage system;
 - ◆ the results from an economic analysis and acceptance/adoption by the legal board or owner of the facility to be served by the holding tank sewage system; and
 - ◆ the future sewage treatment plant capacity and commitment by the responsible management entity that the required plant capacity portion will be reserved and allocated to the facility to be served into the future beyond the anticipated use period for the holding tank sewage system.